

We claim:

1. A method for determining the exhaust gas recirculation mass flow of an internal combustion engine, comprising the steps of:

- mixing fresh air with exhaust gas from the internal combustion engine recirculated via an exhaust gas recirculation pipe,
- supplying the resulting gas mixture to at least one cylinder of the internal combustion engine,
- determining the exhaust gas recirculation mass flow of the exhaust gas recirculated via the exhaust gas recirculation pipe by determining a characteristic curve, dependent on various operating parameters of the internal combustion engine, representing the cylinder mass flow of the gas mixture supplied to the at least one cylinder of the internal combustion engine,
- measuring the fresh air mass flow of the fresh air,
- adapting the characteristic curve of the cylinder mass flow to the fresh air mass flow known for various operating points of the internal combustion engine, and
- determining the exhaust gas recirculation mass flow as a function of the fresh air mass flow measured at a particular transient operating point of the internal combustion engine, using the adapted characteristic curve of the cylinder mass flow.

2. The method according to claim 1, wherein the characteristic curve of the cylinder mass flow is adapted to the fresh air mass flow known for the various operating points of the internal combustion engine, in such a manner that for each of these operating points in the case of at least one known exhaust gas recirculation mass flow the equation  $dm_{AGR} = dm_{zyl} - dm_{HFM}$  is at least approximately true, whereby  $dm_{AGR}$  designates the known exhaust gas recirculation mass flow,  $dm_{zyl}$  the cylinder mass flow according to the adapted characteristic curve and  $dm_{HFM}$  the particular known fresh air mass flow.

3. The method according to claim 2, wherein the characteristic curve of the cylinder mass flow is adapted to the fresh air mass flow known for the various operating points of the internal combustion engine, such that for each of these operating points in the case of a known exhaust gas recirculation mass flow of zero the equation  $dm_{zyl} = dm_{HFM}$  is true.
4. The method according to claim 1, wherein the exhaust gas recirculation rate of the exhaust gas recirculated via the exhaust gas recirculation pipe is calculated from the exhaust gas recirculation mass flow determined in each case in accordance with the method and the fresh air mass flow measured in each case by forming a ratio.
5. The method according to claim 1, wherein the characteristic curve of the cylinder mass flow is adapted while the internal combustion engine is in operation.
6. The method according to claim 1, wherein the exhaust gas recirculating mass flow is determined at each operating point of the internal combustion engine from the adapted characteristic curve for the cylinder mass flow, and the fresh air mass flow measured in each case at this operating point in accordance with the equation  $dm_{AGR} = dm_{zyl} - dm_{HFM}$ , whereby  $dm_{AGR}$  designates the exhaust gas recirculating mass flow to be determined,  $dm_{zyl}$  the cylinder mass flow in accordance with the adapted characteristic curve and  $dm_{HFM}$  the fresh air mass flow measured in each case.

7. A device for determining the exhaust gas recirculation mass flow of an internal combustion engine, comprising:

- an exhaust gas recirculation pipe for recirculating fresh air mixed with an exhaust gas from the internal combustion engine
- at least one cylinder of the internal combustion engine receiving said gas mixture,
- fresh air mass flow measuring means for measuring the fresh air mass flow of the fresh air,
- exhaust gas recirculation mass flow determination means for determining the exhaust gas recirculating mass flow of the exhaust gas recirculated via the exhaust gas recirculation pipe, whereby the exhaust gas recirculation mass flow determination means are designed in such a way that they determine the exhaust gas recirculation mass flow on the basis of a characteristic curve of the cylinder mass flow of the gas mixture supplied to the at least one cylinder of the internal combustion engine, dependent on various operating parameters of the internal combustion engine and on the basis of the fresh air mass flow measured by the fresh air mass flow measuring means, wherein the exhaust gas recirculation mass flow determination means are designed in such a way that they adapt the characteristic curve of the cylinder mass flow to the fresh air mass flow known for various operating points of the internal combustion engine, and determine the exhaust gas recirculation mass flow as a function of the fresh air mass flow measured at a particular transient operating point of the internal combustion engine using the adapted characteristic curve of the cylinder mass flow.

8. The device according to claim 7, wherein the exhaust gas recirculation mass flow determination means are designed to adapt the characteristic curve of the cylinder mass flow to the fresh air mass flow known for the various operating points of the internal combustion engine, in such a manner that for each of these operating points in the case of at least one known exhaust gas recirculation mass flow the equation  $dm_{AGR} = dm_{zyl} - dm_{HFM}$  is at least approximately true, whereby  $dm_{AGR}$  designates the known

exhaust gas recirculation mass flow,  $dm_{zy1}$  the cylinder mass flow according to the adapted characteristic curve and  $dm_{HFM}$  the particular known fresh air mass flow.

9. The device according to claim 8, wherein the exhaust gas recirculation mass flow determination means are designed to adapt the characteristic curve of the cylinder mass flow to the fresh air mass flow known for the various operating points of the internal combustion engine, such that for each of these operating points in the case of a known exhaust gas recirculation mass flow of zero the equation  $dm_{zy1} = dm_{HFM}$  is true.

10. The device according to claim 7, wherein the exhaust gas recirculation mass flow determination means are designed to calculate the exhaust gas recirculation rate of the exhaust gas recirculated via the exhaust gas recirculation pipe from the exhaust gas recirculation mass flow determined in each case in accordance with the method and the fresh air mass flow measured in each case by forming a ratio.

11. The device according to claim 7, wherein the exhaust gas recirculation mass flow determination means are designed to adapt the characteristic curve of the cylinder mass flow while the internal combustion engine is in operation.

12. The device according to claim 7, wherein the exhaust gas recirculation mass flow determination means are designed to determine the exhaust gas recirculating mass flow at each operating point of the internal combustion engine from the adapted characteristic curve for the cylinder mass flow, and to measure the fresh air mass flow in each case at this operating point in accordance with the equation  $dm_{AGR} = dm_{zy1} - dm_{HFM}$ , whereby  $dm_{AGR}$  designates the exhaust gas recirculating mass flow to be determined,  $dm_{zy1}$  the cylinder mass flow in accordance with the adapted characteristic curve and  $dm_{HFM}$  the fresh air mass flow measured in each case.